KIDS WORKING WITH COMPUTERS!

THE
COMMODORE®
LOGO MANUAL

Thomas Milton Kemnitz
Lynne Mass
Joseph Kuffler
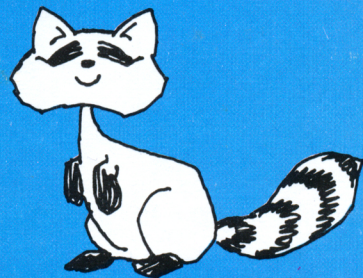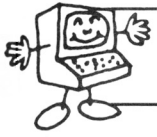**Michael Rubin**
Debbie Toll

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Introduce Yourself to LOGO

Let's meet our computer. To start:

1. Turn on monitor, disk drive, and computer.
2. The screen will show:

    `READY`
    `□`

    The blinking white box is called the **cursor.** Now insert the LOGO diskette and shut the door.
3. Type:

    `LOAD ''LOGO'',8`
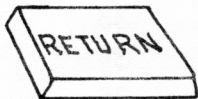
    Then press **RETURN.**

4
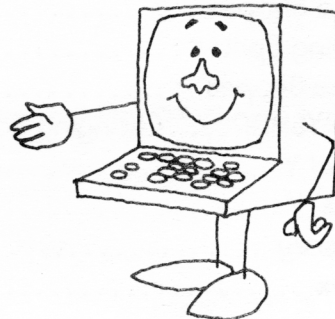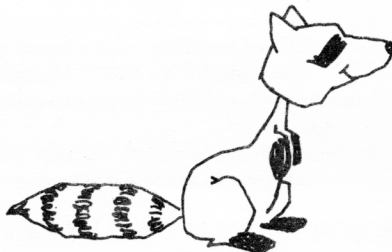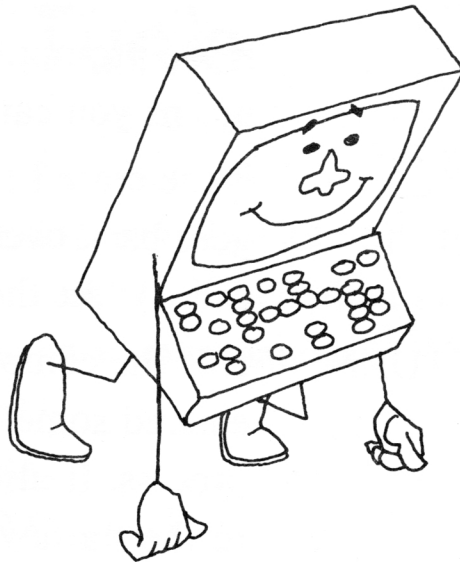
4. The screen will display:

READY
□

Type RUN and press RETURN.

5. After about a minute and forty-five seconds, you will see:

WELCOME TO LOGO!
? □ ← *Blinking dark blue box*

You are ready to begin.

If you have an **initialized disk,** remove the LOGO disk and insert your own disk so that you can save your programs.

IMPORTANT KEYS

?	is the prompt. When it appears, it means you can start typing.
INST DEL	is the erase key. When you type it, it goes back over mistakes and then you can correct them.
RETURN	tells the computer that you have entered something you want it to process. It also sends the cursor back to the starting position on the next line.
CTRL	when held down, allows you to use the letter keys for special functions. For a list of those functions, see page 28.
↑	repeats the last line you typed.
f1	makes the screen all text.
f3	makes the screen split between text and graphics.
f5	makes the screen entirely graphics.

2

Meet the Turtle

What can your turtle do? Your LOGO turtle can move forward, back, right, and left. When given as commands, these directions have abbreviations:

FORWARD   FD
BACK   BK
RIGHT   RT
LEFT   LT

Then you can get him to stand on his head! Let's find out how to do this.

In order to meet your turtle, type:

```
SHOWTURTLE
   or
HOME
   or
DRAW
```

You now have a triangle that looks like this pointing up on your screen:

It can draw things that you command it to draw. Try this:

`FORWARD 30`

Then press RETURN. What happens?

What happens if you don't put a space between FORWARD and the number? Try it to find out.

Try other numbers.

Try LEFT and RIGHT commands with different numbers.

To get rid of everything you have drawn on the screen, type **CLEARSCREEN** or **CS.** To make the turtle return to where he began, type **HOME.**

Practice this lesson and try to draw a square.

GO HOME

3
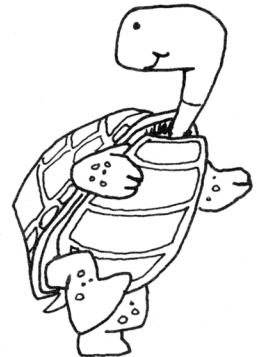
Turtle Colors

Can turtle drawings be colorful? Yes, they can! If you have a color monitor, you can have a **background** color and a **pencolor,** using code numbers for the colors.

The color codes are:

0 = black	6 = blue	12 = medium gray
1 = white	7 = yellow	13 = light green
2 = red	8 = orange	14 = light blue
3 = cyan	9 = brown	15 = light gray
4 = purple	10 = light red	
5 = green	11 = dark gray	

You can also use shortcut codes for both background and pen colors. Try this:

```
?BG 4
?PC 0
?FD 45
?RT 45
?FD 45
?RT 45
?FD 45
```

What did you see? **BG** is the shortcut command for "Set Background Color." **PC** is the shortcut command for "Set Pencolor."

Now try experimenting with your own color programs.

> NOTE: Certain combinations of colors do not always turn out as you would expect. For instance, on a blue background, PC 5 (green) appears to be a very light yellow, but the line changes color dramatically if you shift to BG 1.

If you are going on to the next lesson, press the key that is marked f1.
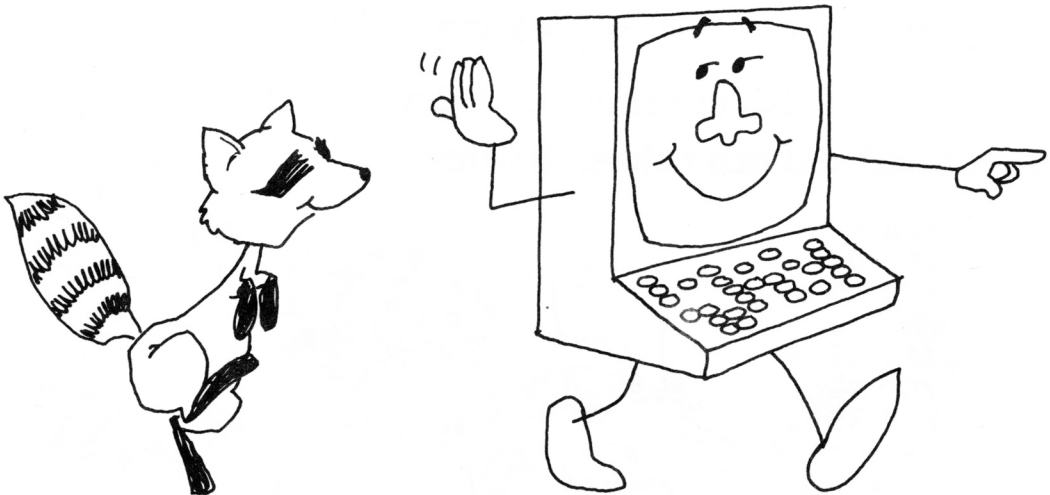
4

Print a Message

LOGO does more than graphics. This lesson and the next one will give you a brief introduction to words (text) and numbers.

Try this by typing exactly what you see:

```
PRINT [HELLO THERE]
      ↑             ↑
   SHIFT         SHIFT
```

Push RETURN. What do you see?

Try it with your own message.
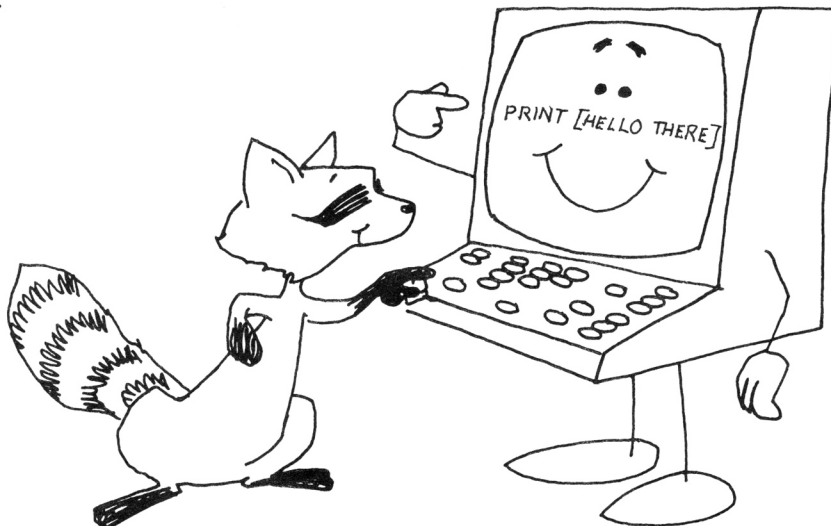
LOGO has a clever way for you to invent your own program. It is called a **procedure** in turtle-talk. Try this:

```
TO SING
```

Every procedure has a title that begins with the word TO. As soon as you push RETURN, the computer knows that you are going to invent a program, and it puts you in the editor (black screen). Note that the editor screen does not have a prompt.

Now type:

```
PRINT [OPEN MOUTH]
PRINT [LA-LA-LA]
```
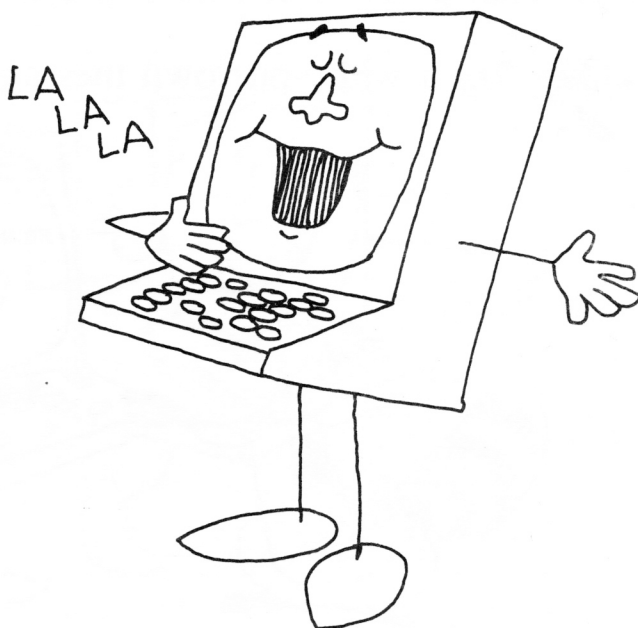
Hold down the **CTRL** key and push **C.** The computer will return you to the blue screen and tell you:

```
SING DEFINED.
```

If you type TO SING again, you will see that CTRL-C also added END as the last line of the procedure.

Now that TO SING is defined, every time you want the screen to read

```
OPEN MOUTH
LA-LA-LA
```

all you have to type is SING and press RETURN. Try it.

This is called *defining a procedure.* CTRL-C signals that you have finished with the editor. **CLEARTEXT** clears the screen.

If you want to repeat a procedure, try this:

```
?REPEAT 5 [SING]
```

What happens?

How could you run this procedure 1,000 times? Try it! To stop, press CTRL-G.

5

Mr. Turtle's Math Magic

LOGO has easy ways to do math. Try this:

```
?PRINT 10 + 9
```

Push RETURN. What do you see?

Now try these. Don't forget to press RETURN after each line.

```
?PRINT 20 - 10
?PRINT 10 * 11
?PRINT 18/9
```

Can you figure out which sign is for addition? subtraction? multiplication? division?

Try out your own ideas.
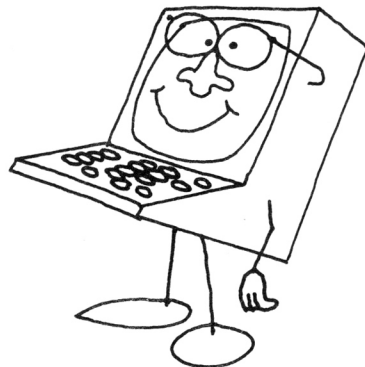
6

How to SAVE and LOAD

If you want to SAVE a procedure, this is what you have to do:

1. Remove the LOGO disk from the disk drive.
2. Insert an initialized disk (see Glossary).
3. Type the following and press RETURN:

    ?SAVE ''SING ← *The procedure title.*
          ↑
    Always type a single set of quotation marks.

The red light on the disk drive will go on and then the monitor screen will tell you the procedure was saved.

> *NOTE: SAVE will save every procedure in memory, so be sure that the procedure you want to save is the only one in memory.*

If you have saved a procedure on disk—or you want another procedure—type **CATALOG** to see the names of the procedures on the disk. Find the name you want, and type READ with a space, quotation marks, and the name of the procedure, like this:

```
READ ''SING
```

Then just type the title and the procedure will RUN.

If you want to name a procedure with more than one word, type a period (not a space) between words, like this:

```
SAVE ''STUFF.FACE
          ↑
```
This is important! It should appear between each two words in the title.

```
READ ''STUFF.FACE
```

7

A Procedure from Mr. Turtle

To teach the LOGO turtle how to write a **program** (a procedure), you type the word TO and some step-by-step instructions. For example, you can write a procedure for a SQUARE. Try this:

```
?TO   SQUARE  ←First type the TO and the TITLE.
>FD  40
>RT  90
>FD  40
>RT  90
>FD  40       Then type the steps in your procedure.
>RT  90
>FD  40
>RT  90
```

When you have finished, press CTRL-C. The **monitor** (screen) will say:

```
PLEASE WAIT
```

Then it will say:

```
SQUARE DEFINED
```

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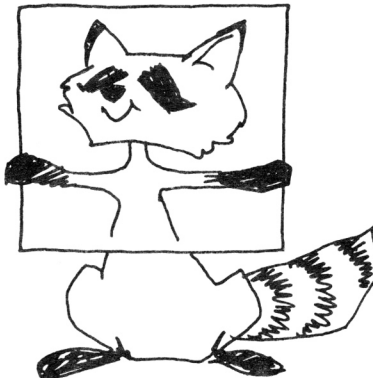
Once you have defined a procedure, the computer's memory will not let you use that name for a different SQUARE unless you **erase (ER)** the memory by typing:

```
?ER ''SQUARE
```

Now you can define SQUARE in a different way. For example, a shorter way to do the same SQUARE is:

```
?TO SQUARE
>REPEAT 4 [FD 40 RT 90]
```

Press CTRL-C. What does the screen say?

How can you SAVE your SQUARE? You are correct if you typed:

```
?SAVE ''SQUARE
```

You can use your SQUARE procedure as a command, over and over. Try this:

```
?SQUARE
?FD 10
?SQUARE
```

What happens?

Experiment with many SQUARES.

8

Building with Procedures

Once you have defined a procedure, you can use it as the building block of a more complicated procedure. Type in:

```
READ ''SQUARE
```

Then try this:

```
?TO SQUAREWHEEL
>REPEAT 12 [RT 45 SQUARE]
>RT 30
>REPEAT 12 [RT 45 SQUARE]
>RT 30
>REPEAT 12 [RT 45 SQUARE]
>END
```

Change the procedure in different ways and see what designs you get.

9
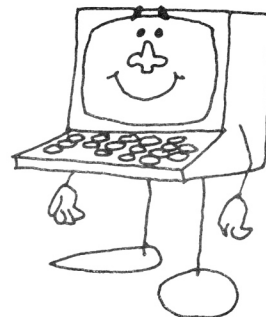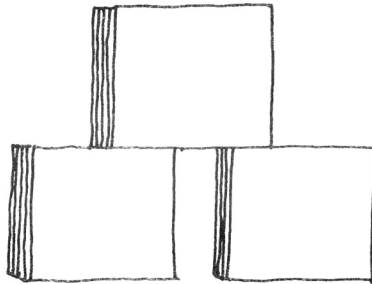
The Printer

If you have a VIC—1525E printer attached to your Commodore® 64, you can print listings of your procedures. To print the text of a procedure, all you have to do is to type:

```
PRINTER
PRINTOUT SING
NOPRINTER
```

If you want to print more than one procedure, tell Mr. Turtle the order in which you want them printed, like this, for example:

```
PRINTER
PRINTOUT [SQUARE SING]
NOPRINTER
```

Do not use any punctuation between the titles of the procedures. You can abbreviate **PRINTOUT** as **PO.** And you can have Mr. Turtle **PO ALL.**

10
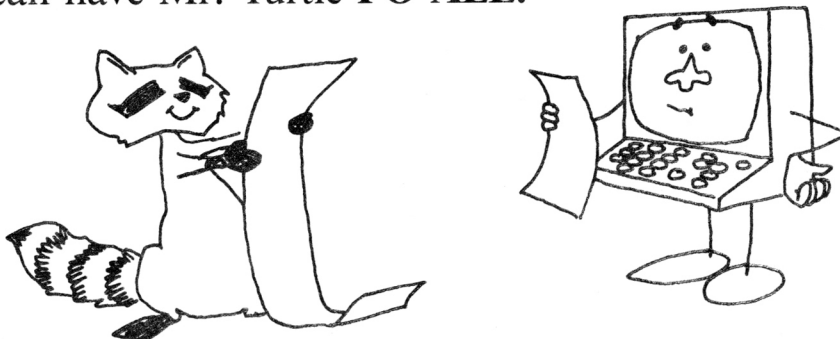
Hide and Seek

It sometimes gets boring watching the turtle move in every direction. The following command will make drawing on the screen faster. It hides the turtle.

```
HIDETURTLE or HT
```

Try this:

```
SQUAREWHEEL
```

Before going on to the next step, type CS. Now try this:

```
?HT
SQUAREWHEEL
```

Did you notice that the lines were drawn faster the second time you did it?

Now add colors to get a nice procedure. (**ST**— **SHOWTURTLE**—returns the turtle.)

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Can I Draw My Face?

Drawing a face on paper is easy. It can be easy in LOGO, too. All you have to do is to be able to lift up the pen and put it down again. You can with these commands:

PENUP (PU)

PENDOWN (PD)

Now try this:

```
?RT 90 FD 15
?PU
?FD 15
?PD
?FD 15
```

Did you draw two lines for eyes?

Try to add a nose and a mouth.

Add colors.

Review

What do these mean:

BG	HT
PC	ST

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Mr. Turtle's Merry-go-round

Have you thought about drawing a circle? It is very easy. All you have to do is use your **REPEAT** command. Try this:

```
REPEAT 360 [RT 1 FD 1]
```

What happened? Why do you think you put 360 after the command REPEAT?

Now that you have made a circle, you are ready to learn an easier way to do it.

13
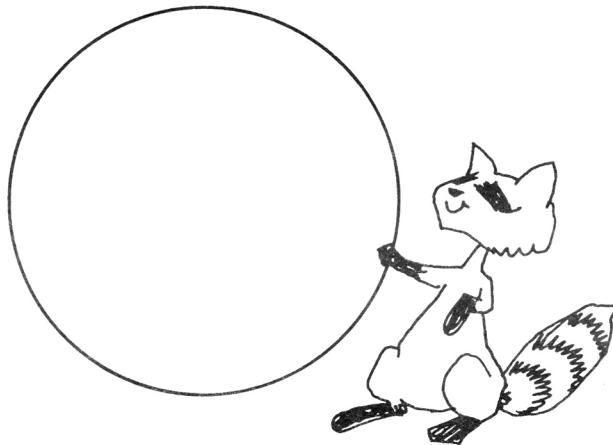
Easy Circles

Try this:

READ ''ARCƧ ← *From Commodore® LOGO Utility Disk*

To get a circle, type:

CIRCLER ЗD
or
CIRCLEL ЗD

The number 30 is the **radius** of the circle. The L stands for "left." CIRCLEL turns the circle to the left.

How could you turn a circle to the right with a radius of 50?

Save the ARCS file on your own disk.

When you draw circles from ARCS, each circle must have an **input.** In this case, the input is the radius. Now look at what the input is for arcs. Try this:

ARCR ЗD 1DD
or
ARCL ЗD 1DD

The first number (30) is the radius. The second number (100) is the distance in degrees around the edge.

Experiment. Make a face.

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Idea Time...Fun with LOGO

You have learned a lot so far, so let's have fun.
Here are some ideas. If you have made a procedure for
SQUARE, LOAD it and type:

```
?TO MANYSQUARE
>REPEAT 4 [RT 90 SQUARE]
>END
```

Now try this:

```
READ ''ARCS
```

Then type:

```
?TO SQUARE.CIRCLE
SQUARE
CIRCLER 50
END
```

This may also be typed:

```
?TO SQUARE.CIRCLE
SQUARE CIRCLER 50
END
```

What is the difference between the two procedures?

15

ERASEFILE

Do you have a program that you want to take off the disk? If you do, type:

```
ERASEFILE ''TITLE
```

This is helpful if you have a procedure you want to change and then SAVE. After you LOAD your procedure and change it, **ERASEFILE** the name and then SAVE the procedure again.
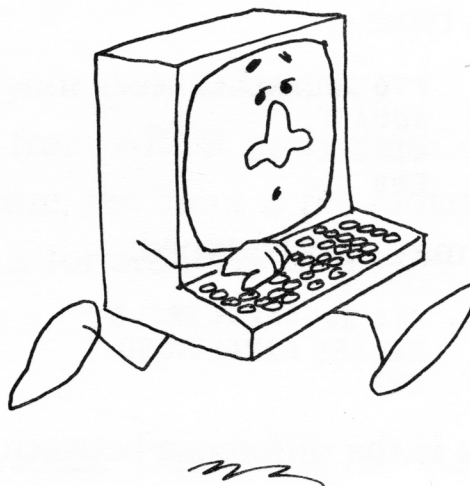
16

The Fixer...Editing

If you make a mistake while writing a procedure, don't worry. It is easy to fix. Suppose you typed this:

```
?TO ME
>FD 45
>RT 90
>FD 45
>RT 90
>FD 45
>RT 90
>FD 25  ←OOPS! You meant to put 45.
>RT 90
>END
```

To correct the mistake, type:

```
?EDIT ME or ?ED ME
```

You will see:

```
?TO ME
>FD 45
>RT 90
>FD 45
>RT 90
>FD 45
>RT 90
>FD 25
>RT 90
>END
LOGO EDITOR
```

Now you can correct your mistake by pressing the CRSR with the up-down arrow until you get to the line with your mistake. Now 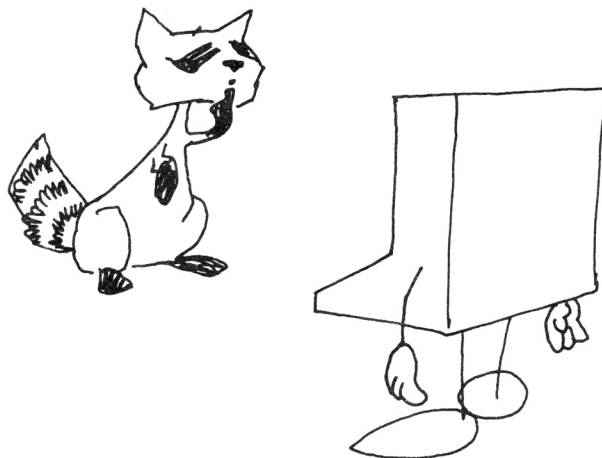press the left-right CRSR until the cursor is over 2. Then press DEL. This erases your error. Now type the correct character, 4. Press CTRL-C when you are finished editing.

Here are some of the things you can do using the CTRL key:

CTRL-A	moves the cursor to the very left of the line it is currently on
CTRL-C	exits the editor
CTRL-D	deletes the character under the cursor
CTRL-G	stops everything; returns you to the control of the computer
CTRL-K	deletes everything on the line to the right of the cursor
CTRL-L	jumps the cursor to the end of the line it is currently on
CTRL-N	in editor, moves the cursor down to the next line
CTRL-O	in editor, opens up a new line for you to use
CTRL-P	in editor, moves the cursor up one line

17

Command Your Computer

COMMAND	WHAT COMMAND DOES
?PO TITLE	prints out the steps in the procedure
?POTS	prints out all the titles of procedures in the memory
?PO ALL	prints out the steps of all procedures in the memory
?ER TITLE	erases the procedure from the memory
?ERASEFILE ''TITLE	erases the procedure from the disk and catalog
?ER ALL	erases all procedures from the memory
?HT	hides the turtle
?ST	shows the turtle
CTRL-W	stops the procedure temporarily; hit any key to continue
f3	splits the screen—part turtle, part words
f1	makes the whole screen use words (full text)
f5	makes the whole screen graphics (all turtle, no words)

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Erasable Pen

Do you have an erasable pen? Now you can have an erasable turtle.

Suppose you had meant to type:

```
?FD 30
?RT 45
?FD 18
```

Instead you accidentally typed:

```
?FD 30
?RT 45
?FD 180
```

You could type:

```
?PENERASE or (PC—1)
?BK 180
?PD
?FD 18
```

Try it. Is everything OK now?

19

Has Your Turtle Lost His Way?

If your turtle has lost its way and you can't see the direction in which it is heading, type:
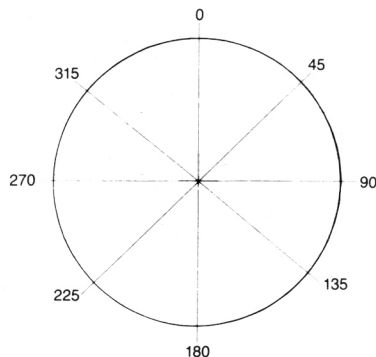
    ?PR HEADING

LOGO will respond with a number such as 180. This means that the turtle is pointing 180° away from straight up.

The drawing shows how a circle would look if you traced it around the outside edge for 360°.

What if LOGO answered 270? Where would the turtle be pointing?

How could you turn the turtle to 0?

20

Turn the Turtle

You have already learned that you can turn the turtle by typing RT or LT and the number of degrees you want to turn. You can also turn the turtle with another simple command, **SETHEADING** or **SETH**.

Suppose the turtle is pointing straight down (toward 180°) and you want it to point straight up. Look at the circle on page 31. What number is straight up? If you type SETH 0 what happens?

How could you point the turtle to the right 135°?

If you want to return the turtle to the center of the screen facing 0°, type HOME.

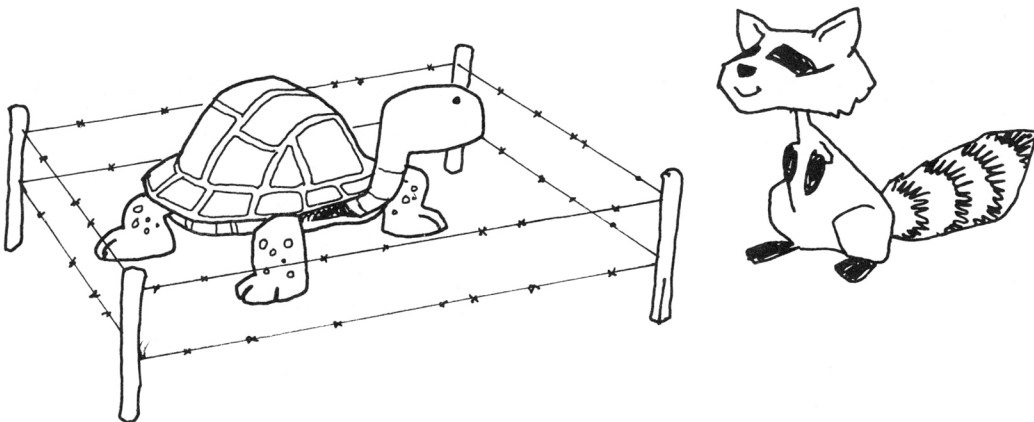# 21

WRAP, NOWRAP

Type:

```
?NOWRAP
?FD 150
```

What happens?

Now type:

```
?SETH 33
?WRAP
?FD 10000
```

What happens?

NOWRAP will put a fence around the screen so the turtle cannot go off the screen. **WRAP** will get rid of NOWRAP.

Fun with Sprites

Your version of LOGO has eight **sprites,** numbered from 0 to 7. The turtle is sprite 0. The other seven appear as parts of a square. To see a sprite, type BG 0. That will give you a white background. Now type HT and, then:

```
?TELL 1
ST
```

You will have part of a square.
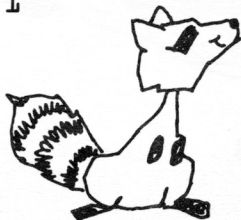
TELL is a command to tell which sprite you are talking to. In this case we have told sprite 1 to show itself. What happens if we tell sprites 2, 3, 4, 5, 6, and 7 to show themselves? Does the square get completely filled in?

If you are playing around with the sprites and forget which is the current one, just ask your computer:

```
WHO
```

Your computer will tell you:

```
RESULT:1
```
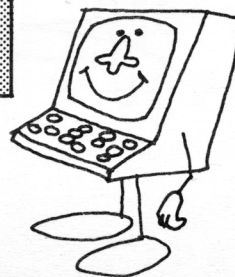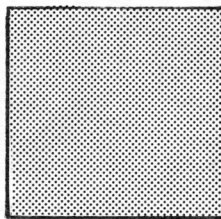
23

Sprite Shapes

Instead of parts of boxes, you can make the sprites a lot of different shapes. Insert the LOGO Utility Disk and type:

```
READ ''SPRITES
READ ''SHAPES
```

Then type:

```
BG 1
TELL 1
HT
TELL 2
HT
TELL 3
HT
```

Now we can find out what the shapes are. Type:

```
TELL 1
SETSHAPE 1
```

And we get a box.

Try all the shapes merely by typing different numbers after **SETSHAPE.**

Then try:

```
READ ''ANIMALS
READ ''VEHICLES
```

Here is a list of available shapes:

Shapes	Animals
1. Frame	Dinosaur
2. Big Ball	Kangaroo
3. Small Ball	Bug
4. Squares	Whale
5. Triangle	Horse
6. Heart	Dog
7. Large Square	Butterfly

Vehicles	Assorted Shapes
1. Truck	Target
2. Car	Truck
3. Bicycle	Rocket
4. Submarine	Balloon
5. Plane	Bow
6. Sailboat	Arrow
7. Hot-Air Balloon	Man

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Moving Sprites

Do you want to make a sprite move? Let's make a balloon drift across the screen. Type in:

```
READ ''VEHICLES
BG 3      ← Blue sky
TELL 0
HT
TELL 1
SETSHAPE 7
ST
PC 4      ← Makes it look purple
SETH 345
REPEAT 250 [FD 1 RT 1 LT 1 FD 1]
```

25
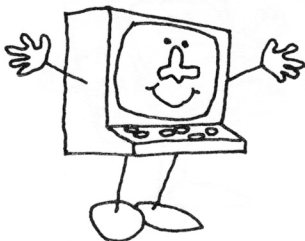
Make Shapes

Do you want to create your own sprites? It's easy. From the LOGO Utility Disk, type in:

```
READ ''SPRED
```

Then type:

```
EDSH
```

The screen clears and the current sprite appears on the right side. On the left is a box to change the shape. The box is twenty-four spaces wide by twenty-one spaces high. You can move from box to box by using the arrows. The space bar leaves a box clear; the * fills a box. You can now redraw the current shape.

26
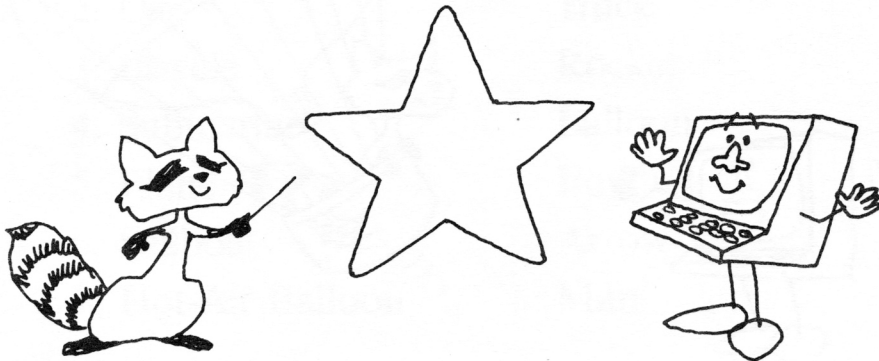
MANYSHAPES...
Changing Squares

In lesson 7, you learned how to make a square. But suppose you wanted to be able to change the size of a square easily. Try this:
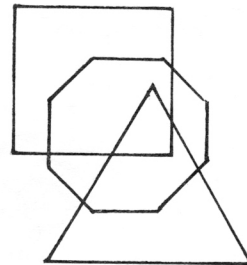
```
?TO SQUARE :SIDE
>REPEAT 4 [FD :SIDE RT 90]
>END
```

Now using that procedure, try this:

```
?SQUARE 40
?SQUARE 10
?SQUARE 20
?SQUARE 30
```

There are endless variations using inputs. You can create many shapes. Try this:

```
?TO MANYSHAPES :SIDE :ANGLE
>FD :SIDE
>RT :ANGLE
>MANYSHAPES :SIDE + 3 :ANGLE
>END
```

Experiment with different inputs such as:
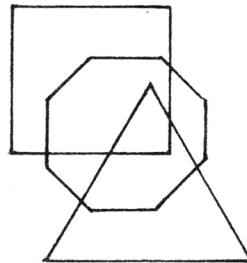
?MANYSHAPES 6 97

When you have seen enough, hit CTRL G.

Try other numbers.

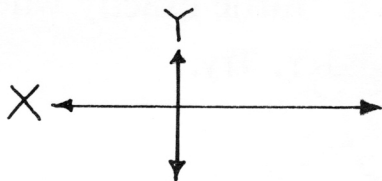Here are some examples of MANYSHAPES that other children have invented:

Title	Inputs for MANYSHAPES	
Star	1	150
Rose	5	94
Doily	1	170
Maze	3	45
Better. Stairs	53	243
Endless. Tunnel	8	90

X and Y

Imagine your screen with crossed lines through it like this:

The vertical (up and down) line is called the Y-axis. The horizontal line (across) is called the X-axis.

To find out where the turtle is, ask the computer to:
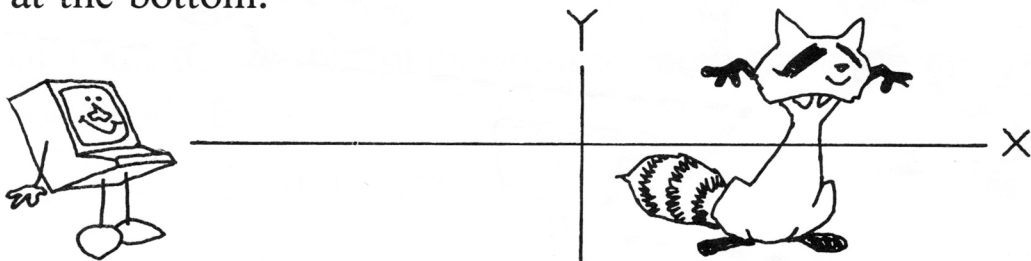
    PR XCOR

Or you can ask it to:

    PR YCOR

COR is short for "coordinate."

HOME is 0. To the right is **positive** on the X-axis; to the left is **negative.** X stretches from -160 on the left to 160 on the right. Y stretches from 125 at the top to -125 at the bottom.

Set X, Y

You can tell Mr. Turtle exactly where to go on the screen by using X and Y. Try:

```
SET X -120
SET Y 30
```

What happened? To move the turtle without leaving a line, use PENUP.
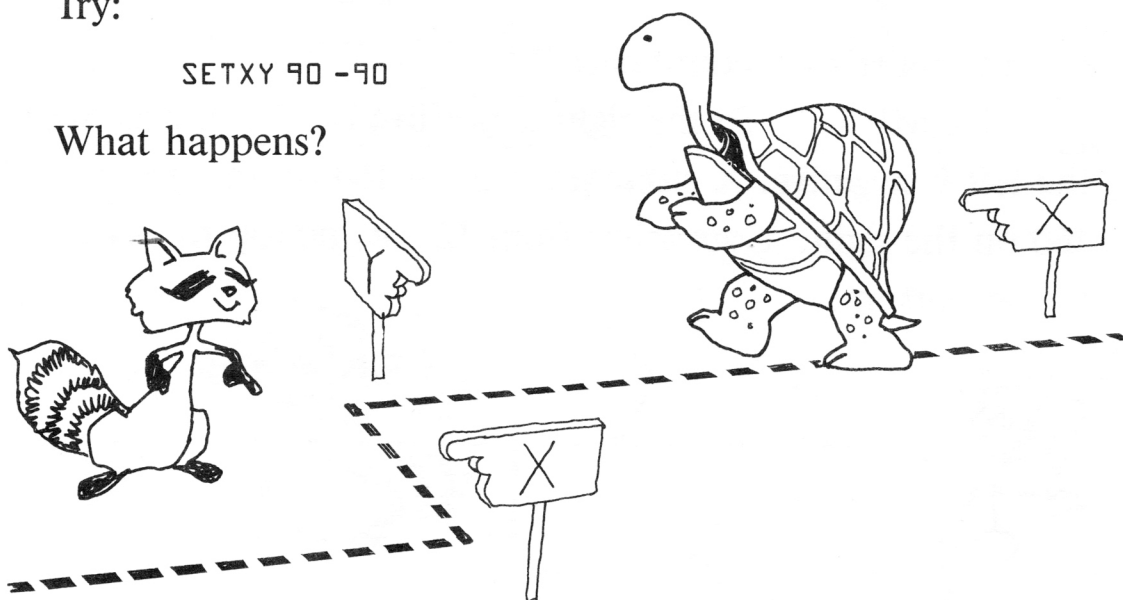
You can set X and Y at the same time by using the command:

```
SETXY -90 90
```
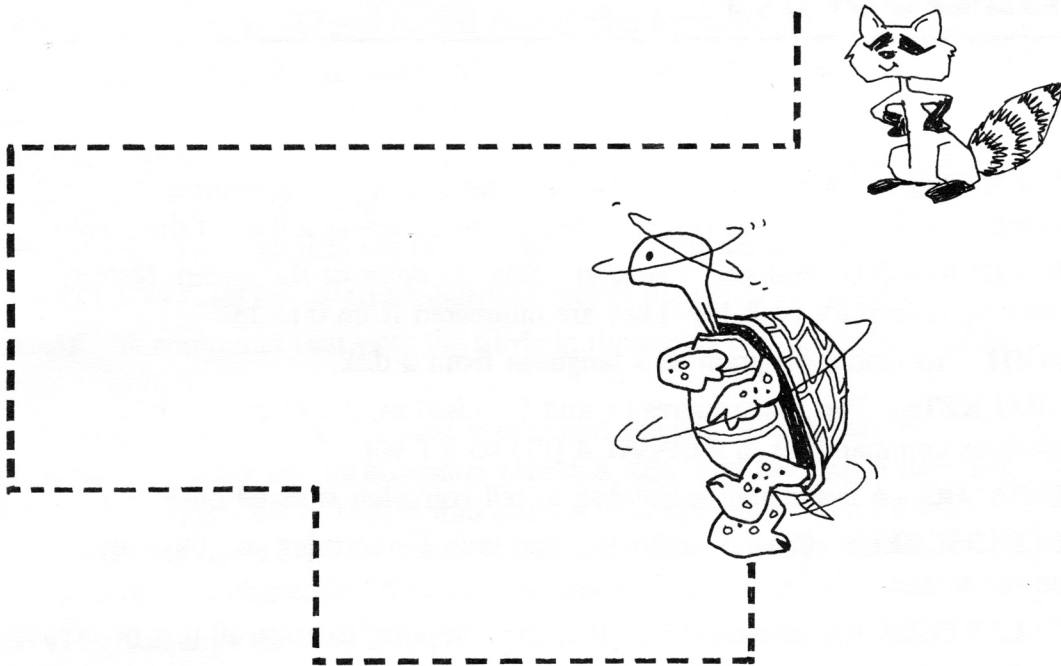
Try:

```
SETXY 90 -90
```

What happens?

If the second number is negative, you must use parentheses, like this:

```
SETXY 30 (-30)
```

You can use SET and COR to move the turtle a specific distance from where it is now on one of the coordinates. Try:

```
SETX XCOR -45
```

Or you can use the combination to move the turtle on both axes. Try:

```
SETXY XCOR 48 YCOR -48
```

GLOSSARY

BACK (BK) and a number   Moves the turtle backward the number of spaces you entered. If the pen is down, the turtle leaves a line on the screen.

BACKGROUND (BG) and a number   Sets the color of the screen. Sixteen different colors are available. They are numbered from 0 to 15.

BOOT   To load a program or a language from a disk.

BRACKETS   Two half squares ([and]). Used in LOGO as part of a complex command, as in REPEAT 4 [FD 40 RT 90]

CATALOG   A command to the disk to tell you what is saved on it.

CLEARSCREEN (CS)   A command that erases everything you have drawn on the screen.

CLEARTEXT   A command that tells the computer to erase all text (words) from the screen (if you are not in the NODRAW mode).

COMMAND   Information you enter that tells the computer what to do.

CURSOR   The blinking square that moves on the screen. It shows where the next character will be printed and moves one space ahead of whatever you are writing.

DISK   Stores information magnetically.

DISK DRIVE   ''Reads'' the disk and converts its information to electrical impulses to be used by the computer.

DRAW   A command that puts the computer in the graphics mode.

EDIT "filename (ED)   A command that allows you to edit a procedure.

END   A statement that tells the computer it has reached the end of a procedure.

ERASE name   A command to erase a procedure from computer's memory. ERASE [name name] allows you to erase more than one procedure from the computer's memory.

ERASE ALL   A command to erase everything in the computer's memory.

ERASEFILE "name   A command that erases a named file from the disk.

ERASEPICT "name   Erases named picture files from the disk.

FORWARD (FD) and a number   Moves the turtle forward the number of spaces you entered. If the pen is down, the turtle leaves a line on the screen.

FULLSCREEN   A command to give you a full screen of graphics—the same result as pressing the f5 key.

HEADING   The direction the turtle is facing—expressed in degrees.

HIDETURTLE (HT)   A command that makes the turtle disappear.

HOME   A command that puts the turtle in the center of the screen pointing straight up (0°).

INITIALIZED DISK   A disk that is prepared for use. A disk can be initialized by turning on the computer and disk drive and inserting a new disk in the drive. Type OPEN 15,8,15 and press RETURN. Then type PRINT #15, "NO: any name, 11" and press RETURN. Your name for the disk cannot exceed 16 characters. You can use any two-digit number.

INPUT   Requires the user to type in a number after a word command when the word is followed by a space and a colon. For example, in a procedure such as SQUARE :SIDE, the :SIDE indicates the need for a number to tell the computer how long to make the side.

LEFT and a number   A command that points turtle to the left the number of degrees you specify.

NODRAW (ND)   A command to put the computer in the mode in which it handles text but not graphics.

NOPRINTER   Turns off the printer.

NOWRAP   A command that prevents the turtle from going off the screen.

OUTPUT   What you see on the screen, printer, or other hardware.

OUTPUT   A command that tells the computer to output a character or word to be printed, read, or used by a procedure.

PENCOLOR (PC) and a number   A command that allows you to control the color of the line the turtle makes. Numbers correspond to the colors listed in lesson 3.

PENDOWN (PD)   A command that enables the turtle to move while drawing. The opposite of PENUP.

PENERASE (PE)   A command that erases lines that have been drawn on the screen by the turtle.

PENUP (PU)   A command that enables the turtle to move without drawing. The opposite of PENDOWN.

POTS   A command that prints out all the titles of all procedures the computer has in memory.

PRIMITIVE   A command built into LOGO, such as FORWARD or REVERSE.

PRINT (PR)   A command that must be entered before writing a statement. For example, PR [HELLO] allows the computer to display HELLO on the screen after you push RETURN.

PRINTER   An output machine that prints a hardcopy of text or pictures.

PRINTER   Tells the computer to send material to the printer.

PRINT HEADING (PR HEADING)   A command that prints on the screen the degrees (to the right of vertical) that the turtle is heading.

PRINTOUT (PO) and a name   A command that prints out the procedure you name.

PRINT XCOR   A command to print out the X-coordinate of the turtle's position.

PRINT YCOR   A command to print out the Y-coordinate of the turtle's position.

PROCEDURE   Instructions to the computer telling it what to do and how to do it. A procedure can be recalled from disk or memory whenever it is needed.

PROMPT   The sign at the beginning of a line, a ?.

READ   A command that tells computer to read the named file from the disk and to load it into the computer's memory.

REPEAT number [directions]   A command that tells the computer to repeat your commands. You must tell the computer how many times to repeat the command.

RETURN   Pushing this key enables you to go to the next line. It also processes whatever has been typed into the computer.

RIGHT (RT) and a number A command that turns the turtle right (clockwise) the number of degrees you specify.

SAVE "name A command that allows you to save procedures on the disk under the name you give the file.

SETHEADING (SETH) A command that lets you change the color of the background of the screen.

SETPICT A command that lets you save pictures as two files on disk.

SETSHAPE number A command that tells a sprite to assume the shape indicated by the number.

SETX number A command that allows you to move the turtle on the X-coordinate to the position you indicate by number.

SETY number A command that allows you to move the turtle on the Y-coordinate to the position you indicate by number.

SHOWTURTLE (ST) A command that places the turtle in the middle of the screen. It puts you in the graphics (drawing) mode.

SMALLX A command that tells a sprite to assume its smallest width.

SMALLY A command that tells a sprite to assume its smallest height.

SPLITSCREEN A command to give you a screen split between graphics and text—the same result as pressing the f3 key.

SPRITE A shape you create or that is stored in the memory.

TELL number A command to alert the numbered sprite that the commands that follow will apply to it.

TEXTSCREEN A command to give you a full screen of text—the same result as pressing the f1 key.

WAIT A command that allows a procedure to pause.

WHO A command to tell the printer to print the number of the sprite currently being addressed.

WRAP A command that allows the turtle to run off one side of the screen and onto the opposite side.

X-COORDINATE A horizontal position as measured from a central line.

Y-COORDINATE A vertical position as measured from a central line.

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